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end.
a driving circuit coupled to said motor speed sensor and to said switch such that said switch switches the number of turns of said phase coil from said first number to a second number when said speed of said motor reaches a reference value.

REMARKS

The Office Action of July 18, 2002, has been received and considered. In the Office Action, claims 1-13 were rejected under either 35 U.S.C. §102 or 35 U.S.C. §103.

Claim 12 has been amended to correct a typographical error. Claim 12 has not been amended to overcome any objections or rejections. Claims 1-13 remain pending. Reconsideration of the application is respectfully requested.

The present invention relates to a method and apparatus for maintaining the force delivered by a motor having at least one phase coil as the speed of the motor increases. In conventional motors, the force, or torque, delivered by a motor decreases as the motor velocity increases. The rate of this decrease is related to the inductance of the phase coil of the motor. As is known, each of these conventional phase coils has a set number of windings and, since inductance is related to the number of turns of the coil, a set inductance.

To overcome this problem of decreasing force, the present invention includes a motor system comprising a motor including a phase coil having a first portion (206a) with a first number of turns and a second portion (206b) with a second number of turns. The motor system also includes a speed sensor for sensing the speed of the motor and an inductance switch for varying the inductance of the phase coil by varying the number of turns of the phase coil from a first number of turns to a second number of turns based on

the sensed speed (See Figures 1 and 2 of the instant application for illustrative examples). Switching the number or turns in this manner has the effect of maintaining the force of the motor as the velocity of the motor increases. This is clearly illustrated by the relationship of curve A and curve B shown in the graph of Figure 4 of the present application.

Claims 1-13 were rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,333,474 to Imai et al. that relates to a washing machine with a motor system for bi-directional operation of a single phase AC induction motor. The patent to Imai discloses a washing machine with a single phase induction motor having two fixed coils that are spaced 90 electrical degrees apart from each other. These coils are identified as a main coil (5b) and an auxiliary coil (5a). The coils each have a fixed number of windings and a fixed inductance. This single phase induction motor has a plurality of operation modes that are achieved by “turning on” or “turning off” one or more triacs connected to the coils so that different coil excitation schemes are achieved by switching in or switching out each entire coil. The single phase motor also includes means for controlling the operation of the triacs so that the motor changes between its different operation modes and different coil excitation schemes when certain speeds are sensed.

In each of these operation modes and its related coil excitation scheme, one or both of the coils are excited so that a rotor rotates in one of two directions. For example, when the motor is in its first operation mode, two triacs 13, 16 are turned on and two triacs 14, 15 are turned off so that the rotor rotates in a counter-clockwise direction. Conversely, when the motor is in the fourth operation mode, the triacs 14, 15 that were turned off in the first operation mode are turned on, and the triacs 13, 16 that were turned

on in the first mode are turned off. As a result, the rotor rotates in a clockwise direction during the fourth operation mode. Additionally, when in the sixth operation mode, only one of the triacs is turned on so that only one of the coils is excited. Hence, according to the patent of Imai, when a different set of triacs is operated, the excitation scheme of the spaced and separate coils is changed and different operation modes are achieved. However, contrary to the present invention, the inductance in each of the separate coils of the Imai motor is not varied. Accordingly, the patent to Imai cannot disclose varying the inductance of a single coil based on a sensed speed.

Claim 1

Claim 1 recites a method for maintaining the power delivered by a motor including at least one phase coil. The method includes the steps of (1) sensing the speed of the motor and (2) varying the inductance of said phase coil based on the sensed speed. The patent to Imai does not disclose the step of varying the inductance of any coil in the Imai motor. Additionally, it does not disclose the step of varying the number of turns in the coil as recited in claim 2. Instead, the patent to Imai only discloses changing the number of spaced, separate coils that are excited in response to the turning on or turning off of related triacs. Specifically, the patent discloses changing the excitation scheme of the two separate, spaced coils based on motor speed. The patent discloses three excitation schemes – (1) exciting both the auxiliary and the main coils, (2) exciting just the main coil or (3) exciting just the auxiliary coil. The patent does not teach varying the inductance of either the auxiliary coil or the main coil. Hence, the patent to Imai cannot disclose the method recited in claims 1-10.

Claim 11

Claim 11 recites a motor including at least one phase module and a system for maintaining motor power comprising a sensor that provides a feedback signal representative of the speed of the motor, a comparing circuit that compares the feedback signal to a reference signal and for generating a switch signal, and a switch coupled to the comparing circuit. Claim 11 recites that the switch is responsive to the switching signal such that the number of turns of the phase coil is switched from a first value to a second value depending on the value of the feedback signal.

The patent to Imai does not disclose a switch that changes the number of turns of a phase coil that can be excited in response to a switching signal. Instead, it discloses a triac switching system that changes which of the separate, spaced coils are excited. As discussed above, Imai only discloses switching in or switching out entire coils. As a result, the patent to Imai cannot anticipate claim 11. Withdrawal of the rejection is requested.

Claim 12

Claim 12 recites a motor system including at least one phase coil having a first number of turns. The motor system further comprises a motor speed sensor coupled to the motor and a switch coupled to the phase coil. Claim 12 further recites that the motor system includes a driving circuit coupled to the motor speed sensor and the switch such that the switch switches the number of turns of the phase coil from the first number of turns to a second number of turns when the speed of the motor system reaches a reference value.

As discussed above, the patent of Imai does not include a switch coupled to the phase coil and a driving circuit such that the number of turns of a phase coil that can be excited is varied by the coupled switch when the speed of the motor reaches a reference value. As a result, the patent to Imai does not anticipate claim 12. Withdrawal of the rejection is requested.

Claim 10 was rejected under 35 U.S.C. §103(a) as being unpatentable over Imai. The Office Action suggests that Imai discloses all of the claimed method except for the motor being rotary. However, as discussed above with respect to the rejection of claim 1, the patent to Imai fails to disclose the step of varying the inductance of the phase coil based on a sensed speed as recited in claim 1. Therefore, even if the patent to Imai was modified as suggested in the Office Action, the resulting combination would not arrive at the method recited in claims 1-10. Withdrawal of the rejection is requested.

In view of the foregoing, it is respectfully submitted that the pending claims are allowable and that the application is in condition for allowance. If any questions or issues remain, the resolution of which the Examiner feels would be advanced by a conference with Applicants' attorney, the Examiner is invited to contact Applicants' attorney at the number noted below.

Respectfully submitted,

By: Brian E. Hanlon
Brian E. Hanlon
Reg. No. 40,449

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Banner & Witcoff, Ltd.
1001 G Street, N.W.
Washington, D. C. 20001-4597
(202) 508-9100

Amended Version Of Claims For U.S. Patent Application No. 09/904,731

In the Claims:

Please amend claim 12 as follows:

12. A motor system including a motor comprising at least one phase coil having a first number of turns, said system further comprising:

a motor speed sensor coupled to said motor for sensing a speed of said motor;

a switch coupled to said phase coil of said motor;

a driving circuit coupled to said motor speed sensor and to said switch such that said switch switches the number of turns of said phase coil from said first number to a second number when said speed of said motor reaches a reference value.